



Puerto Rico Sea Grant 2015 Briefing Book

NOAA National Sea Grant Office

Site Review Team

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Puerto Rico Sea Grant

2015 Briefing Book

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Knowing Puerto Rico Sea Grant

The coastlines of the archipelago of Puerto Rico and the US Virgin Islands, includes near-shore reefs, near-shore islands, mangroves, wetlands, estuaries, tidal flats, sand dunes and the coastal land margin. The biodiversity contained in these ecosystems is threatened by climate-related changes, seasonal to decadal climate processes and human population pressures. The increased incidence of storms, coral diseases, human-induced habitat degradation and intensive fishing are significantly responsible for observed declines in associated fishes and invertebrates. Our coastal zone is a finite resource and its capacity to withstand intensive use and development has reached a critical limit. Approximately twenty-four percent (24%) of the coastline of Puerto Rico has been developed, fifty-six percent (56%) of the population live in the 44 coastal municipalities of the archipelago, and ninety percent (90%) of the hotels and tourism infrastructure are located and dependent on coastal and marine resources. Preliminary findings of our strategic planning process demonstrated challenges and suggested adjustments that set our sights on the education of constituents to spur changes in behavior that would lead to conservation and sustainable development. As an archipelago of island communities, we need to become more resilient to a changing climate and consider implementing a number of adaptive strategies, including public awareness and education.

The Puerto Rico Sea Grant Program has been the key player in the sustainable development of Puerto Rico's marine and coastal resources since 1979. Through strong educational efforts, efficacious applied research and aggressive marine extension projects, we have effectively tackled ocean and coastal issues faced everyday by our users' communities. Sea Grant has responded swiftly to the stringent challenges faced by Puerto Rico's coastal and marine resources through emphasis in three focus areas: Healthy Ecosystems and Habitats, Education and Workforce Development and Hazard Resilient Communities and Economies. Through the utilization of an interdisciplinary approach, which combines ecosystem based management with human dimensions, the UPRSCG has evolved into a diversified program which addresses coastal and marine emerging issues by maintaining its focus on the goals and objectives set forth in our Strategic Plan and those of the National Oceanographic and Atmospheric Administration (NOAA), the National Sea Grant College Program and the University of Puerto Rico.

Program Leadership

Arguably, Puerto Rico Sea Grant is an institution recognized by its leadership in research, outreach and education. The number and quality of the partnerships, the constant communication with the stakeholders and clientele, and the request for our expertise and collaboration in a number of initiatives (fisheries regulations, scientific outreach, beach safety, climate change, resilient coastal communities, marine protected areas, ocean literacy, joint publications, boards and extension projects) serve as example of our leadership.

Connecting stakeholders and the clientele: Marine Outreach Program (MOP)

The Puerto Rico Sea Grant Program is considered a trustworthy program by the clientele of marine resource users, and thus is consulted on a consistent basis due to our technical competence, unquestionable commitment to the sustainable development of our natural attractions and resources, a genuine affection for the clientele and an effective performance with the public and the private industry. We are partners with Federal and Commonwealth agencies on resource management programs, including highly migratory species, marine protected areas management plans and stewardship, coastal risk assessment, waterfront planning and development, beach access, coastal tourism and marine recreation, safety and management and climate change. Our MOP is the key component leading the task of forming partnerships, and engaging stakeholders.

In touch with the public: Sea Grant Communications

Our publications, posters, and videos are well recognized and highly praised. In fact, a number of partnerships are based on joint efforts in publications, TV programs, short videos and the dissemination of information.

GeoAmbiente TV Program (WMTJ-TV SISTEMA TV)- As a co-sponsor of the 9 Emmy Award winning and 23 times nominees environmental programs *GeoAmbiente* and *Aventura Científica*, PRSG's presence on local television has been amplified through its dissemination to more than 11 states by their alliance with the broadcasting company WAPA America.

Our collaboration with WMTJ-TV is an innovative education and marketing strategy that offers us the opportunity to reach a vast audience directly from the only Puerto Rico-PBS member station.

Fuete y Verguilla (The Vertical Line)

In a collaboration with the Interdisciplinary Center for Coastal Studies (CIEL, by its Spanish acronym), PRSG produces the quarterly magazine *Fuete y Verguilla (The Vertical Line)*, a publication for artisanal fishers, resource managers, scientists, and people interested on topics related to commercial fishing. Through this magazine, PRSG informs fishers about laws and regulations, fishery closures, scientific aspects about fisheries, economic opportunities, fish and seafood safety, safety at sea, cultural and social aspects of fishing communities, and ways to cope with problems related to commercial fishing. *Fuete y Verguilla* has printed and electronic versions.

Puerto Rico Sea Grant in social networks

Nowadays, people of all ages and different backgrounds communicate and get informed through the Internet. Social networks are key instruments to disseminate information and educate constituents about the wise use of marine and coastal resources, its conservation and sustainable development. Our Facebook page has received more than 2,500 “likes” and almost 1,100 persons and organizations “follow” us on Twitter. Social networks also allow us to: 1) share new publications and disseminate relevant information through our webpage, 2) broadcast events, and 3) receive feedback from our stakeholders and resource users.

Marejada (Swell)

Marejada is PRSG’s official magazine. Through this publication we disseminate information related to marine and coastal resources, scientific research, public policy issues, ocean literacy, coastal community resilience, sustainable development and community-based efforts. *Marejada* is published twice a year and is widely distributed along the Archipelago of Puerto Rico, and through our webpage in its digital format.

One Step Ahead: Leading Research Efforts

The need to analyze ecological and social systems in an interdisciplinary approach was recognized by our program in the early 1980’s, thanks to the vision of our past directors. Our program promotes applied research efforts that are focused on people’s knowledge, values and behaviors and how these influence and are affected by decisions related to the conservation, management and policy development of coastal and marine resources. Besides the interdisciplinary nature of the projects, our research efforts harmonize with the Program’s vision and mission and embrace innovativeness and the incorporation of graduate and undergraduate students.

During the last 30 years, Sea Grants’ integrated research, education and extension efforts have generated empirical data and conceptual frameworks that are being applied by coastal and marine resource managers in diverse policy development, evaluation and implementation processes. Below are a few excellent examples of how our program is investing in applied research, in favor of Puerto Rico’s coastal and marine resources.

Advancing our efforts to emphasize the relevance of the human dimension in the management of coastal and marine resource users, PRSG funded a project where researchers developed a methodological blueprint to engage mixed qualitative and quantitative methods to provide policy makers with critical information for fulfilling the true objective of public policy: to enhance people’s overall quality of life and well-being. Other human dimensions research provided information regarding commercial and recreational fishers’ knowledge about the fisheries and compliance of regulations.

Recent Sea Grant research also proved to be important to resource managers by providing indications that essential nursery habitat for blacktip and lemon sharks in the USVI require the implementation of measures to protect them from anthropogenic impacts. Research on the abundance and diversity of crustacean macrosymbionts and the population dynamics of corkscrew sea anemones on Caribbean reefs advanced the field of demographic studies on coral reefs, recommending a minimum body size for collecting anemones to ensure population stability. In another project, fine-scale movement patterns were quantified for bonefish, and considerable habitat partitioning among individuals proved to be important for stock management and habitat protection.

In recent years, Puerto Rico Sea Grant ventured on the possibility of exploring potential shoreline change and associated land loss as a result of continuing sea-level rise of selected associated islands of Puerto Rico (PR) and the United States Virgin Islands (USVI). The US Fish and Wildlife Service is currently using the results and recommendations of this project to develop a similar study to address the possible effects of sea level rise associated to climate change on the small islands of Puerto Rico and the US Virgin Islands.

Research that examined the application of the Soil and Water Assessment Tool (SWAT) to estimate runoff and sediment yields from the Río Grande de Añasco Watershed highlights the degree of connectivity among coffee farms, other agricultural practices and urbanization with all marine resources located along the coast of Añasco and Rincón, and its implications on the management of coral reefs, specifically those of the Tres Palmas Marine Protected Area, leading the way in watershed management.

An interesting and novel study on integrons (a genetic system carried by bacteria which has been implicated in the establishment and dispersal of antibiotic resistant traits which include protection mechanisms against the most important antibiotics used for the treatment of infection in humans as well as in plants and animals of economic importance) is expected to set the framework for the development of measures supporting the protection of coastal environments and improvements for public safety.

In an effort to save lives and educate the public as well as local authorities about the possibility of hazardous surfzone conditions, Sea Grant invested in a project that led to the development of two online tools to reduce drowning incidents at the beaches of Puerto Rico: the CariCOOS Near-shore Wave Model (www.caricoos.org/drupal/swan_multigrid) and CariCOOS-SeaGrant Near-shore Breaker Model (www.caricoos.org/drupal/nearshore_breaker). Data derived by this project is being used by the National Weather Service to provide safety information to beach goers.

In another innovative effort, Sea Grant research confirms the importance of seasonal meteorological conditions that result in shifts of dinoflagellate community and bioluminescence levels. In other words, the importance of seasonality in determining the *P. bahamense* and *C. furca* cell densities.

Advancing Ocean Literacy: The Challenge of Marine Education

Puerto Rico Sea Grant has been a leader in marine education over the last 35 years. Our efforts are founded on the solid previous work developed by past Sea Grant educators and our current commitment to assess what students know about the ocean and coastal resources, and redress the lack of ocean related content in Puerto Rico's science education standards and instructional materials. With our current ocean literacy effort, Puerto Rico Sea Grant has taken a giant step that is expected to generate changes in curricula, build capacity for formal educators, and provide them with needed educational tools and enhance their scientific knowledge, communication and interpretive skills.

The Ocean Literacy Effort is comprised of the:

- Development and publication of the interdisciplinary teachers' educational guides *The Marine Grass Beds* and *The Mangroves*, which are part of an effort designed to introduce 4th to 12th grade Spanish speaking teachers and students to these essential coastal and marine habitats, their conservation and sustainable development. These educational guides were developed and coordinated by our education and curricula development specialist, with the collaboration of our staff and graduate students from the UPR Department of Marine Sciences. The guides include a scientific background of the ecosystems, presentations with notes for the teachers, educational plans aligned to the new standards of the Federal Department of Education and the Puerto Rico Department of Education, student activities, laboratories, a thematic guide, and a pre and post test to measure knowledge gains. The materials also include a DVD with all the documents in the guides and provide editing and adaptation capabilities to different scholastic levels and student characteristics, as well as available resources. This educational effort has been approved by the Department of Education and will serve as a pilot project during the second semester of the 2014-2015 academic year. The curricula is being implemented in 30 schools along the island and included a workshop for the 30 selected science teachers that will be responsible for the development of the effort at their schools. Teacher training by Sea Grant education specialists is an essential component of this effort. The development of educational guides for the areas of coral reefs ecosystems and climate change are the next two curricula being developed to complete the effort.

- Puerto Rico Sea Grant through its magazines, *Marejada* and *Fuete y Verguilla*, disseminates relevant information about conservation and sustainable use of marine and coastal resources, educates diverse audiences, and provides a forum to share knowledge, increase ocean literacy, and outline a wide variety of sustainable economic activities and opportunities offered by our marine and coastal resources.
- In collaboration with the United Nations Educational, Scientific and Cultural Organization (UNESCO), the *Sandwatch* program in Puerto Rico has already recruited 19 groups composed of 250 volunteers working with the *Sandwatch* methodology 4 times a year at their selected coastal communities. Volunteers gather interesting data regarding erosion and accretion, beach composition, human activities, beach debris, water quality, waves, longshore currents and flora and fauna. This information is available to resource managers, students, public policy developers, and others interested in the analysis of the information collected. These volunteer groups are also making use of the *Sandwatch* videos to guide them in their education efforts and in the development of activities. Our UNESCO partner has contacted Hawaii Sea Grant and they are contemplating the idea of developing a *Sandwatch* project in American Samoa. Leaders and groups are mastering the different activities and while they are taking data, they are applying scientific and mathematical knowledge, writing skills, technical skills and creative abilities. Information related to *Sandwatch* Project and videos can be found in *Sandwatch's* blog: <http://www.seagrantpr.org>.

Engagement of Stakeholders in Program Development, Service and Stewardship

Puerto Rico Sea Grant Program is a unique program that serves as a network, connecting and engaging a number of stakeholders from different environmental, social and institutional contexts. Our program is viewed as an honest broker that is able to work with a number of different, often contentious parties, involved in the conservation, use and stewardship of coastal and marine resources. Sea Grant partners come from the wide variety of resource users, the scientific community, coastal communities, government agencies, decision makers, other Sea Grant Programs and the private sector, among others.

As with many other programs in the nation, our partners contribute to the Sea Grant mission in outreach, education, and research. They are also, an essential component of the program's management, through the Advisory Council. In sum, our partnership philosophy and the engagement of stakeholders in the Sea Grant mission is based on honest brokerage, transparency, open collaboration and our commitment to participate at the many and varied levels required by the process of stewardship. It is through that process that Puerto Rico Sea Grant is able to expand its outreach to a larger population of the clientele, increase capacity building, inform public policy, contribute to the mission of local and federal agencies, tend to the needs of NGOs and the private sector and serve coastal communities appropriately as they strive for resilience and sustainability

Engaging stakeholders in the Puerto Rico Sea Grant Mission: A Brief Look

Partnerships are also beneficial to the growth and development of Puerto Rico Sea Grant. In order to strengthen and to expand the capabilities of the Marine Outreach Program, Puerto Rico Sea Grant continues a partnership with the Interdisciplinary Center for Littoral Studies (CIEL) from the Social Sciences Department at UPR-M, providing support and engaging with Sea Grant staff in a number of projects, mostly related to Human Dimensions, Sustainable and Resilient Coastal Community Development, and Fisheries. We have also developed very successful partnerships with the Caribbean Integrated Ocean Observing System (CariCOOS), the United States Fish and Wildlife Service (USFWS), US Virgin Islands Center for Marine and Environmental Studies, USVI Department of Planning and Natural Resources, NOAA's Coastal Zone Management Program (CZMP), the Puerto Rico Department of Education, the US National Weather Service, the United States Lifesaving Association (USLA), St. Thomas Fishermen Association, National Parks Company, UPR School of Architecture, Center for Hemispheric Cooperation in Research and Education and Engineering and Applied Sciences (CoHEMIS), Center for University Access (CUA), Coralatons, the Municipal Government of Culebra, Sea Grant Southeast Region, Hawaii Sea Grant, South Carolina Sea Grant, Florida Sea Grant, Maine Sea Grant. These are a few examples:

- The island of Culebra has suffered from the lack of technical and political processes regarding the use of its land and the design of the urban environment, including transportation (air, water and land) resulting

in a disordered development and declining community. An urban development master plan for the municipality of Culebra has been elaborated with the collaboration of a team of twelve (12) architecture graduate students and Professors Fernando Plá and Andrea Bauzá from the School of Architecture of the UPR (SAUPR). The students already completed the integrated urban master plan which is expected to guide and ensure the orderly development of the community and acknowledge the interdependence of urban systems, the way places influence wellbeing, work and lifestyle, and its interconnection with Culebra's natural ecosystems: mangroves, beaches, spectacular scenery, sea grasses and coral reefs. Technical understanding of interconnected systems such as transport, energy, waste and information as well as the effects of global issues, such as climate change resilience and economic uncertainty were also taken into consideration in the development of the plan. The quantifiable and subjective aspects of spatial, social, environmental and economic contexts was also tested and refined. The third stage of the effort consists on the adoption of the plan by the municipal government of Culebra. It is expected that the Central Government will provide the funding to implement this urban master plan. Professor Plá estimated the cost of the effort conducted by the UPR School of Architecture to be close to \$273,000 which was offered as an in kind investment from the UPR. As part of this effort the School of Architecture graduate students also developed and designed a plan for the facilities of the Flamenco Beach Park at Culebra at an estimated cost of \$185,000, also an in kind investment from UPR.

- To improve the quality of life of the residents of Culebra by developing efforts to enhance the educational opportunities of young residents and reduce the number of school dropouts, Sea Grant developed a collaborative effort with the Center for University Access (CUA) from the University of Puerto Rico. This effort is directed to retain students at schools and increase admission to superior educational institutions and re-establish hope and pride among the young population. Thanks to Sea Grants efforts, funding to cover the costs of the CUA for Culebra (\$76,000) for one year, have been provided by the College Access Challenge Grants Program for the implementation of the CUA-Culebra, a yearlong extramural program in a hybrid format (present and remote) that is expected to strengthen standards and expectations in Spanish, English, Mathematics and Sciences. The CUA is a mentorship program that includes Intermediate and High School students to strengthen aspirations to study at a university, orientation about college degrees and assist them in the application process for college.
- During the past 14 years, 420 persons drowned in Puerto Rican beaches. In other words, every 12 days a person drowns at the beaches of Puerto Rico and neither the government of Puerto Rico nor the agencies with the responsibility to manage the beaches of Puerto Rico are taking corrective actions to reduce that absurd situation. In 2007, Puerto Rico Sea Grant took charge of this situation and developed an effort to reduce drowning incidents in our beaches by coordinating a visit from the United States Lifesaving Association (USLA) president and a delegation to assess the beaches of Puerto Rico. As a result of the visit, the USLA produced the publication "Aquatic Safety Assessment & Recommendations: Commonwealth of Puerto Rico". USLA academies for lifeguards were coordinated with the collaboration of Florida USLA lifeguards who trained and capacitated PR National Park Company (PRNPC) lifeguards to improve their aquatic abilities and rescue techniques. At least two academies per year were conducted from 2010 to 2014. In 2011, the PRNPC adopted the USLA standards in their lifeguard's academies as recommended and they have already certified 116 lifeguards under USLA standards and developed a sense of pride and responsibility for the lifeguarding profession. During the month of January 2015, Sea Grant has coordinated an effort with the USLA, the International Hospitality Enterprises and the State Agency for the Management of Emergencies and Disaster Administration to study the possibility of developing and implementing a pilot lifeguard program at a San Juan beach where approximately ten (10) drowning incidents occur every year. This will be for the first time that the private sector has offered to invest monies to deal with drowning incidents at the beaches of Puerto Rico, and all this thanks to Sea Grants' efforts.
- Through the collaboration among NOAA partners including: **National Weather Service Forecast Office in San Juan (NWS-SJU), Caribbean Coastal Ocean Observing System (CariCOOS) and Sea Grant Puerto Rico** an interesting partnership was developed to achieve our mission of saving lives. The NWSFO will start issuing a Surf Zone Forecast for 15 beaches in Puerto Rico and U.S. Virgin Islands developed by CariCOOS under a research project sponsored by Puerto Rico Sea Grant. The first issuance of this product was on November 1st, 2014 when the swell season started with long period swells that affect our regional waters several times each month, threatening beach goers with rip currents. These wave-induced currents

include many of the 30 reported drowning deaths a year at the beaches of Puerto Rico. The Surf Zone Forecast (SRF) provides valuable and life-saving information for the general public and providers of beach safety services, such as lifeguards and emergency managers. The SRF product includes information for selected beaches in Puerto Rico and U.S. Virgin Islands regarding: *location, breaking wave height, rip current risk and forecast of wind, weather and temperature.*

Our Partners and Key Stakeholders in Projects and Activities

The following is a list of our key partners and stakeholders who join hands with Puerto Rico Sea Grant in a number of activities.

Federal

NOAA Fisheries, JOBANEER, Caribbean Fisheries Management Council, Land Grant Cooperative Extension Service, Environmental Protection Agency (EPA), US Forest Service, U.S. Geological Survey (USGS), U.S. Army Corps of Engineering (USACOE), Natural Resources Conservation Service (NRCS), United States Fish and Wildlife Service (USFWS), NOAA in the Caribbean, and International Institute of Tropical Forestry.

Local and State

Department of Natural and Environmental Resources (DRNA), PR Tourism Company, WIPR Channel 6 (PR Government TV Station), Consortium for Food Safety Education in PR, Surfrider Foundation, USVI Fish and Wildlife Service, NOAA Ocean Explorer, Vieques National Refuges, Department of Health, Municipality of Rincón, PR Senate, PR House of Representatives, PR National Parks Company, Municipality of Culebra, Municipality of Cabo Rojo, Department of Education, Humacao Nature Reserve, Punta Tuna Nature Reserve, Puerto Rico Conservation Trust, Center for Hemispheric Cooperation in Research and Education and Engineering and Applied Sciences (CoHEMIS), Hawaii Sea Grant, Florida Sea Grant, North Carolina Sea Grant, Maryland Sea Grant, Office of the Commissioner of Vieques and Culebra, Puerto Rico Environmental Quality Board, Puerto Rico Planning Board.

NGOs

Alianza Ciudadana para la Educación en Energía Renovable, Comité Pro Desarrollo de Maunabo, Natural History Society of PR, Programa de Educación Comunal de Entrega y Servicios, Inc. (PECES), Coralations, Villa Palmera Residents Association, Puerto Rico Marine Education Association (APEM), Amigos de Tres Palmas, Toabajeños en Defensa del Ambiente (TDA), Sociedad Ornitológica de PR, Instituto de Ciencias de la Conservación (INCICO), FEPDEMAR (The Fishers' Federation), Proyecto Coquí, Mayagüezanos por la Salud y el Ambiente, Martí Coll Foundation, SCUBA Dogs, Surfrider Foundation.

International

European Community Blue Flag Program, UNESCO, The Nature Conservancy.

Industry/Business

Ford Motor Company Conservation and Environmental Grants, G-Works, GeOambiente, International Hospitality Enterprises, Puerto Rico Hotel and Tourism Association, Palmas del Mar Resort, Marina Owners Association, La Regata: The Nautical Newspaper of Puerto Rico, Rincón Beach Resort, Hotel Villa Cofresí, Aquatica Dive Shop.

Academic Institutions

UPR Aguadilla Recycling and Environmental Orientation Center, UPR Bayamón, UPR Río Piedras, Inter American University at Aguadilla, Interdisciplinary Center for Coastal Studies, Nation United Pro Environment (NUPA), Caribbean Integrated Ocean Observing System (CariCOOS), University of South Florida-College of Marine Sciences, Partnership for Research and Education Materials (PREM) of the Department of Physics UPR-Humacao, and UPR-Humacao McNair Program, University of Puerto Rico Carolina, School of Architecture UPR, Inter American University School of Law, Ana G. Méndez University.

A Participatory Strategic Plan 2014-2017

During the last centuries, Puerto Rico established its buildings, ports, roads, power lines and sewage systems, in hazard-prone areas within the coastal zone. Besides, fifty six percent of the almost four million citizens in Puerto Rico live within the 44 municipalities bordering the Atlantic Ocean and the Caribbean Sea. This route of coastal development increases the potential vulnerabilities associated with sea level rise and shoreline erosion. These increased rates of climate-related environmental changes have made the island's coastal communities vulnerable in ways never before imagined which are expected to have a series of socio-economic effects, including loss of land infrastructure and coastal resources, which implies a decline in economic, ecological, cultural and subsistence values associated with the coast. The long-term sustainability of Puerto Rico and its people is dependent on coastal ecosystem's health. These critical ocean and coastal issues have been tackled effectively by the set of general guidelines provided by consultation with our Advisory Council, MOP staff, and the key stakeholders, such as resource users, resource managers, researchers and policy makers who participated in meetings to discuss this matter. We also included the results of the deliberations with resource managers and scientists, through the Caribbean Regional Assessment project. Puerto Rico Sea Grant strategic plan is the tool used to plan activities, and to establish a long-term commitment to key processes pertaining to program management, education, outreach and research.

Under this context, our program has been able to provide integrated, applied research, outreach and education projects to solve problems and create benefits and opportunities for coastal communities and marine resource users in the Caribbean region.

Our Strategic Plan 2014-2017 incorporates the NOAA and NSGO priorities and aligns them with our goals, strategies, outcomes and performance measures. UPR institutional culture and integrity, combined with a commitment to the Sea Grant core values, provide us the strength to achieve the goals set forth in this plan. <http://seagrantspr.org>.

The University of Puerto Rico Sea Grant Program Administration

Sea Grant is based at the University of Puerto Rico in the western municipality of Mayagüez (UPR-M). Our program is one of the components of the Research and Development (R&D) Center from UPR-M, directed by Marisol Vera, Ph.D. PRSG also has its Education offices at the UPR-Humacao, on the east coast.

Administratively, Sea Grant responds to the R&D Center, UPR-Mayagüez's chancellor, John Fernández, Ph.D. the president of the UPR system, Uroyoán Walker, Ph.D., and the vice-president for Research and Technology, José A. Lasalde, Ph.D. The University of the Virgin Islands, and its Center for Marine and Environmental Studies, is our key institutional partner housing the Virgin Islands Marine Advisory Service (VIMAS). Administratively, the University of the Virgin Islands Marine Advisory Service responds to Dr. Paul Jobsis, Director of the Center for Marine and Environmental Studies.

The PRSG Program Administration is directed by Ruperto Chaparro, MA and comprises:

Tania del Mar López Marrero, PhD Associate Director, Director of our Marine Outreach Program and director of UPRM's Interdisciplinary Center for Coastal Studies (CIEL)

Cristina D. Olán-Martínez, MA, Communication Coordinator

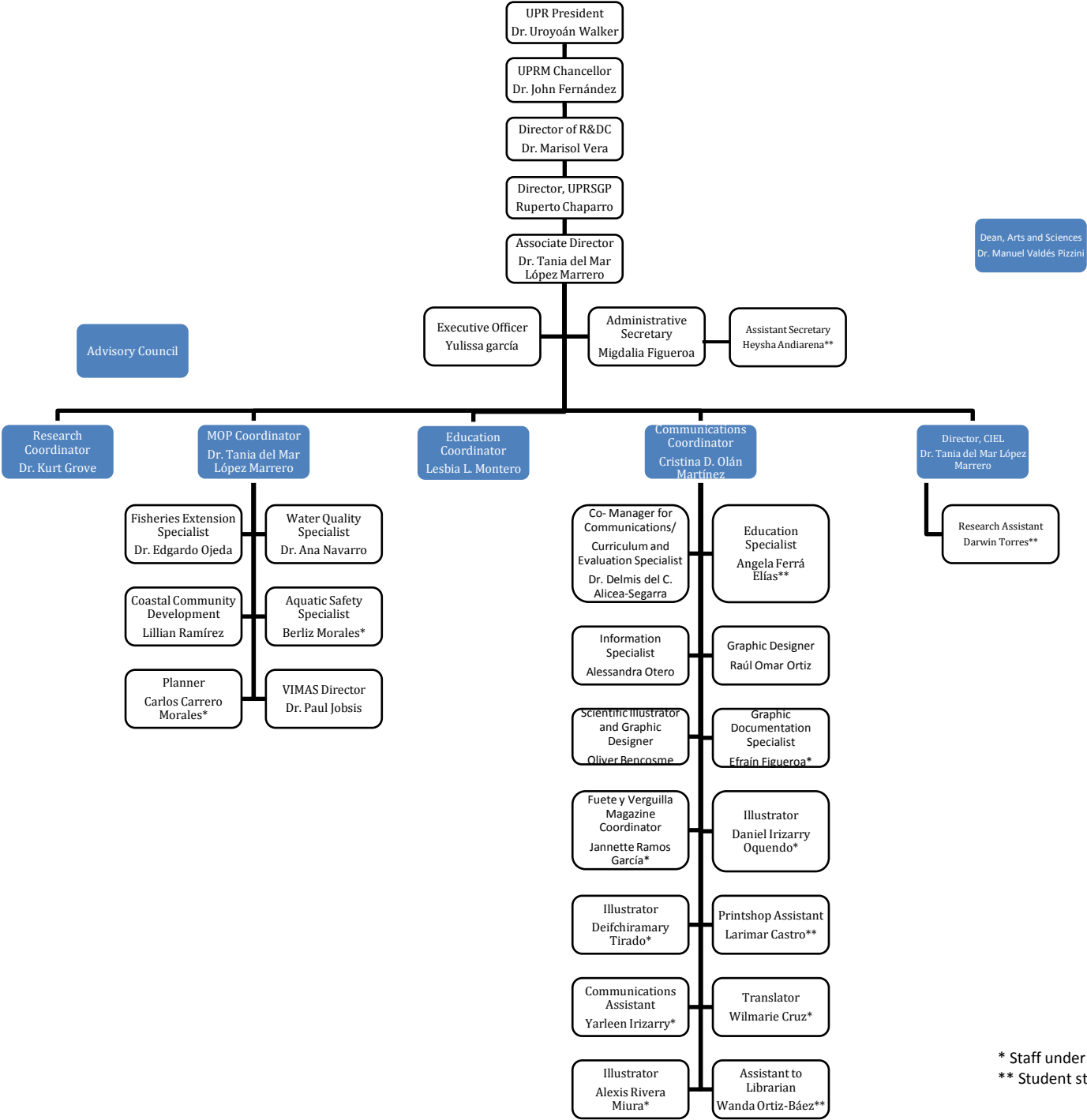
Kurt Grove, PhD, Research Coordinator

Yulissa García, MBA, Executive Officer

Lesbia Montero, BS, Marine Education Coordinator

Paul Jobsis, PhD, VIMAS Coordinator

Organizational Structure of Puerto Rico Sea Grant



* Staff under professional service contract
** Student staff

Most of Puerto Rico Sea Grant leadership team members are located at the Mayagüez Campus, and therefore are able to meet almost daily to discuss program issues. Relevant electronic correspondence is distributed among all staff, and meetings are held on a consistent basis for all the program components. The Interdisciplinary Center for Coastal Studies has been an outreach partner for Sea Grant since 2008, as stated in the Omnibus proposal. Therefore, the CIEL staff and director are essential components of the Sea Grant mission, a relationship fully supported by UPR administrators.

Sea Grant Staff

Name	Position	Sea Grant FTEs	Non-Sea Grant FTEs	Total FTEs
Ruperto Chaparro	Director	0.675	0.325	1
Tania del Mar López Marrero	Associate Director/Marine Outreach Program Director/UPRMs' Interdisciplinary Center for Coastal Studies (CIEL) Director		0.22	0.22
Kurt Grove	Research Coordinator		1	1
Yulissa García	Executive Officer	1		1
Cristina D. Olán-Martínez	Communications Coordinator		1	1
Oliver Bencosme	Graphic Designer		1	1
Raúl Ortiz	Graphic Designer		1	1
Delmis del C. Alicea-Segarra	Curriculum and Evaluation Specialist		1	1
Lillian Ramírez	Research Associate	0.5	0.5	1
Edgardo Ojeda	Research Associate	0.45	.55	1
Ana Navarro	Research Associate	.45	.55	1
Alessandra Otero	Information Specialist	1		1
Migdalia Figueroa	Administrative Secretary	1		1
Lesbia L. Montero	Education Coordinator	0.5	0.5	1
Carlos Carrero	Research Assistant	1		1
Jannette Ramos	Research Assistant	1		1
Berliz Morales	Research Assistant	1		
Paul Jobsis	Acting Director of the Center for Marine & Environmental Studies		.08	.08
Marcia Taylor	Extension Agent (Virgin Islands)		1	1
Charmane Joseph	Secretary (Virgin Islands)		0.04	0.04
Daniel Irizarry	Illustrator	.80		.80
Deifchirarmy Tirado	Illustrator		.40	.40
Wilmarie Cruz	Translator	.25		.25
Yarleen Irizarry	Communications Assistant	.50		.50

Sea Grant Student Staff

Name	Position	Sea Grant FTEs	Non-Sea Grant FTEs	Total FTEs
Angela Ferrá	Marine Educator	.53		.53
Heysha Andiaarena	Assistant Secretary	.53		.53
Larimar Castro	Printshop Assistant	.53		.53

Name	Position	Sea Grant FTEs	Non-Sea Grant FTEs	Total FTEs
Wanda Ortiz-Báez	Assistant to Librarian	.40		.40
Darwin Torres	Research Assistant		.53	.53

Advisory Council

The Puerto Rico Sea Grant Advisory Council (AC) is composed of a selected group of recognized leaders from non-governmental organizations (NGO's), local government, state and federal agencies, university groups and the private sector, who advise our administration team by addressing the needs and priorities of Puerto Rico's marine and coastal resources, coastal communities, policymakers and the business sector. The AC assists our program by serving as a bridge to the outside world. They are providers of fresh insights about funding opportunities and partnerships, access to valuable resources, powerful connections and public relations. This group of volunteers meets twice a year to provide guidance and advice regarding outreach, education and research needs of Puerto Rico's ocean and coastal resources. The AC opens a window of exchange and helps our institution by reviewing and evaluating programs and services, improving relationships with other organizations, raising funds and promoting public relations. The advice and support provided by the AC contributes significantly to the Puerto Rico Sea Grant improvement.

The success of our relationship with the AC is that our management team: 1) genuinely requests the committee's input; 2) respects the knowledgeable and committed volunteer members; 3) provides access to information about our program, so that they can offer useful advice and support; and 4) serves as an effective two way communication channel regarding the role of the committee has been clearly established.

List of Advisory Council Members

Juan Lara, PhD	Economics Department, University of Puerto Rico, Río Piedras Campus (economist)
Ariel Lugo, PhD	International Institute of Tropical Forestry (ecologist)
Juan G. González, PhD	Professor Emeritus (oceanographer)
Julio Morell, MS	IOOS Caribbean Regional Association (oceanographer)
LaVerne Ragster, PhD	Former University of the Virgin Islands President (oceanographer)
José Rafols	Aquatica Underwater Adventures (private sector)
María Falcón	Entrepreneur (TV producer)
Robert J. Mayer, PhD	University of Puerto Rico, Aguadilla Campus (marine biologist)
Miguel Rolón, MS	Caribbean Fisheries Management Council (fisheries)
Fernando Silva, MS	Sciences Institute for Conservation (ecologist)

Responding to the PAT Concerns

The PRSG was last reviewed by the Program Assessment Team (PAT) on March 15-16, 2011, recognizing the experienced leadership of our program which has created an energetic and enthusiastic Sea Grant Program that is deeply embedded in all aspects of coastal management and is appreciated throughout the Commonwealth. These accomplishments are the result of hard work, a committed and excellent staff, the guidance of our AC and the fiscal and intellectual support of the University of Puerto Rico. As in the past biennium, a number of goals and objectives have been reached for the protection and sustainable beneficial uses of Puerto Rico's coastal and marine resources.

The main tasks of Puerto Rico Sea Grants' administration team are to maintain the level of appropriate administrative structure while continuing to improve the program's management that has allowed PRSG to be a household name in Puerto Rico and the US Virgin Islands, and respond in a coordinated and constructive way to needs and opportunities that span the full range of our programs' responsibilities. It should also maintain the close collaboration of all members of the Sea Grant team, provide mentoring and opportunities to help them mature as students and as responsible citizens. We have made great inroads in this direction and will continue to do so. No recommendations were made by the 2011 SRT but it was suggested that: "It may be worthwhile for the program to assemble an annotated list of its contributions to help explain PRSG's value to both its supporters and to those involved in determining its budget allocations." The list is included as an addendum.

Recruiting New Talent

The Puerto Rico Sea Grant RFP is distributed to an established database which represents a number of research institutions and investigators. Pre-proposals are received and evaluated by peers in a process similar to what we use for full proposals. Fifteen of these are invited to submit full proposals. Proposals are then sent for peer-review.

Reviewers

All reviewers and Technical Review Panel (TRP) members are selected from outside the Commonwealth of Puerto Rico and the U.S. Virgin Islands. A well-balanced group of reviewers, recognized in their fields and knowledgeable about the socio-historical and environmental context of Puerto Rico and the U.S. Virgin Islands was selected from universities and government agencies in the United States. All TRP members sign a disclosure form, stating that they have no conflicts of interest. These remain on file in our office.

The scores (from three independent reviews) and comments from the peer-reviews are sent to the TRP for their assessment. A ranking is developed, based on the average score of at least three independent reviews. Seven TRP members participate in the process of reviewing the set of proposals and subsequently meet with the PRSG management team and Program Officer to discuss the merits of the proposals and the peer reviews. The meeting takes place via conference call in early September.

Each proposal is assigned to a member of the TRP who presents a written summary of the proposal and the peer reviews. The summaries are sent to all the TRP members a week before the conference call. During the conference call the proposals are presented by the lead TRP member and the merits of each project are discussed. The TRP develops a list of recommended projects based on their relevance to the Program's mission and vision, scientific merit, applicability, innovativeness, and interdisciplinary approach.

How Omnibus RFP Priorities are Set

- Staff recommendations in the Strategic Plan process, as well as in the design of the RFP.
- Input from our discussion with the AC and researchers at different meetings and resource conservation events in Puerto Rico and the U.S. Virgin Islands.
- Discussions and recommendations from researchers at the Puerto Rico Sea Grant Research Symposium, and Ocean Chats.
- Results from our on-going Caribbean Regional Assessment (CRA) project to identify critical and priority areas for coastal and marine conservation. The results are based on interviews, focus groups (stakeholders, researchers and government officials), survey research, and literature review.
- Discussion among the Sea Grant Leadership Team
- Recommendations from the Technical Review Team

The final selection for 2015-2017 includes projects that will contribute to the sustainability of coastal and marine resources in Puerto Rico and the U.S. Virgin Islands, and to our understanding of: coral reef health and rehabilitation, habitat connectivity, fish diseases, mesophotic ecosystems, marine mammals, water quality, coastal communities vulnerability assessments, beach restoration.

The Technical Review Panel

Our success in setting an appropriate and relevant research agenda, reviewing pre-proposals and proposals in a seamless process was largely due to the expertise and commitment of our Technical Review Panel. The names, expertise, and institutional affiliation of the members of our TRP provided below.

Members of the Technical Review Panel (TRP)

Name	Agency	Specialty
Alejandro Acosta	Florida Fish and Wildlife Conservation Commission	Fisheries Biology
Brian Blanton	RCI,UNC Chapel Hill	Oceanographer
Harry Daniels	NC State University	Water Quality, Aquaculture
Dale Griffin	USGS	Microbial ecology
Klaus J. Meyer-Arendt	University of West Florida	Coastal Geomorphology
Mark Moberg	University of South Alabama	Anthropology
Richard Webb	USGS	Hydrologist

The Technical Review Panel members participated in the final full proposal selection. In 2014, the meeting to determine the TRP recommendation was conducted via telephone conference call. The three-hour call was conducted on September 9 to discuss the merits of the projects. During the intensive meeting, verbal summaries of the proposals and reviews were presented for each proposal to complement the written summaries that had been produced and distributed to all panel members several weeks prior to the conference call. Each TRP member was assigned as a discussion leader for one or two proposals. Peer reviews were also presented and discussed. At the end of the presentations, a vote was taken for the top six proposals. This created a TRP recommendation list that included the top ten proposals. From these, the Puerto Rico Sea Grant management team discussed ranking, peer reviews, program thematic areas, and selected a set of projects that best suited our program's mission, thematic areas and budget.

Biennium / Years	Research Projects	Peer Reviewed Publications
2012-2014	4	0
2014-2016	5	0
2015-2017 mini	6	0

By the Numbers: Pre-proposals, Full Proposals

2012-2014 Omnibus

- 32 pre-proposals submitted from 17 institutions and 23 new PIs'
- 14 full proposals submitted from 9 institutions and 7 new PIs'

2014-2016 Omnibus

- 30 pre-proposals submitted from 18 institutions and 22 new PIs'
- 14 full proposals submitted from 8 institutions and 10 new PIs'

2015-2017 Minibus

- 7 pre-proposals submitted from 4 institutions and 5 new PIs'
- 6 full proposals submitted from 3 institutions and 4 new PIs'

Leadership on Boards & Committees

- Special Olympics
- European Community Blue Flag Beaches
- Climate Change Advisory Committee to the Governor of Puerto Rico
- Ford International Business Development of Puerto Rico Environmental Grants
- Environmental Education National Strategy Committee
- Puerto Rico Climate Change Council
- Caribbean Fishery Management Council Advisory Panel
- EcoExploratorio Advisory Panel
- Puerto Rico Chapter of the U.S. Lifesaving Association
- Amigos de Tres Palmas
- Sustainable Coastal Communities Development Network: Southeast Region
- Natural Hazards Mitigation Committee of the Autonomous Municipality of Cabo Rojo
- Caribbean Integrated Ocean Observing System Stakeholders Council

Fellowship Recipients

Knauss Fellowship Program

- 2015 Wessley Merten
- 2014 Ivonne Bejarano
- 2011 Rosa Linda González-Marrero

Success in National Competitions

Lionfish in the South Atlantic and Caribbean: Integrated Regional Research and Extension to Support Effective Management of an Invasive Marine Species

Regional Multi Program Projects

Lionfish in the South Atlantic and Caribbean: Integrated Regional Research and Extension to Support Effective Management of an Invasive Marine Species. A project in collaboration with the University of South Florida Sea Grant College Program.

Coastal ecosystem assessment: Identification and characterization of cubozoans in Puerto Rico that pose a threat to human health. A project in collaboration with the University of Hawaii Sea Grant College Program.

16th International Conference on Shellfish Restoration: Restoration in an Ever-Changing World. In collaboration with the South Carolina Sea Grant Consortium.

The University of Puerto Rico Sea Grant College Program is currently developing a Memorandum of Agreement with the University of Florida Sea Grant College Program, the University of Hawaii Sea Grant College Program, and the University of Guam Sea Grant Coherent Area Program to form a regional network focused on sub-tropical/tropical and island related coastal issues.

Program Development Projects

2010-2012	
1.	<i>Coastal erosion, sediment characterization and beach profiles in Rincón beaches, PR.</i> Scott, Krystina
2.	<i>Measuring reef fish abundance for species threatened by overfishing.</i> Mateos, Daniel
3.	<i>Apoyo a la Comisión de Estrategia Nacional de Educación Ambiental (ENEA) de Puerto Rico. Organización para el Desarrollo Sustentable</i>
4.	<i>Demography of the threatened staghorn coral <i>Acropora cervicornis</i>: Implications for its management and conservation initiatives.</i> Mercado-Molina, Alex
2012-2014	
1.	<i>Population dynamic analysis of the long-spined <i>Diadema antillarum</i>.</i> Rodríguez, Ruber
2.	<i>Ecological responses to nutrient enrichment in a coastal mangrove system.</i> Jessen, Brita
3.	<i>Photographic survey of the bottlenose dolphin <i>Tursiops truncatus</i> population off Puerto Rico.</i> Rodríguez, Grisel
4.	<i>Importancia del tamaño relativo de colonias de abanicos de mar con respecto al tamaño de sus lesiones.</i> Ruiz-Díaz, Claudia
5.	<i>Validación método rápido detección contaminación fecal (FastEnt).</i> Otero, Ernesto
6.	<i>Estimación de las proporciones sexuales en la colonia anidante de la tortuga <i>Cary, Eretmochelys imbricata</i> de nidos incubados en condiciones naturales y las implicaciones del cambio climático en Isla de Mona, Puerto Rico.</i> Barrientos, Karla
7.	<i>Metagenomic analysis of the whole gut contents of the lionfish in Puerto Rico.</i> Harms, Chelsea
8.	<i>Nesting ecology and genetic characterization of leatherback turtle (<i>Dermochelys coriacea</i>) in Northeastern and Eastern coast of Puerto Rico.</i> Ramírez, Christian
9.	<i>Dinámica poblacional de <i>Millepora</i> spp. y la relación con las corrientes marinas.</i> Murcia, Juan D.
10.	<i>Seeding reefs with <i>Diadema antillarum</i> to enhance coral recovery in Puerto Rico.</i> Williams, Stacey
11.	<i>Reef fish connectivity in a marine protected area network in Puerto Rico and across the Caribbean.</i> Beltrán, Diana
12.	<i>Proteomic profiles of two threatened Caribbean coral species under ambient temperatures.</i> Ricaurte, Martha
13.	<i>Coastal ecosystem assessment: Identification and characterization of cubozoans in Puerto Rico that pose a threat to human health.</i> Yanagihara, Angel Anne
14.	<i>Determining <i>Coryphaena hippurus</i> movements, excursion frequency, and site fidelity relative to a stationary fish aggregating device network off San Juan, Puerto Rico.</i> Merten, Wessley
2014-2016	
1.	<i>Inventory of dune locations and characteristics along the Puerto Rico coastline.</i> Grafals, Rosana
2.	<i>Deployment of storm surge data loggers (hobos) in PR.</i> Mercado, Aurelio
3.	<i>Documenting and mitigating scientific marine debris at La Parguera, Puerto Rico.</i> Corredor, Jorge
4.	<i>Population connectivity of <i>Agaricia lamarcki</i> from mesophotic and shallow reefs.</i> Hammerman, Nick
5.	<i>Soil and vegetation remediation strategies after field fires in the hills of PR.</i> Flores, Mario
6.	<i>Redescubriendo a los peces y a los pescadores: Espacios interdisciplinarios para la construcción de sistemas de manejo.</i> Arocho, Arelis
7.	<i>Genetic evaluation of hydrocoral <i>Millepora</i> species complex using next generation sequencing.</i> Ortiz-González, Ingrid
8.	<i>Effect of allelopathic products of macroalgae (<i>Dyctiota</i> spp., <i>Halimeda</i> spp. and <i>Padina</i> spp.) in growth, survival and branching of <i>Acroporis cervicornis</i>.</i> Pentzke-Lemus, Ligia L.

Program Funding

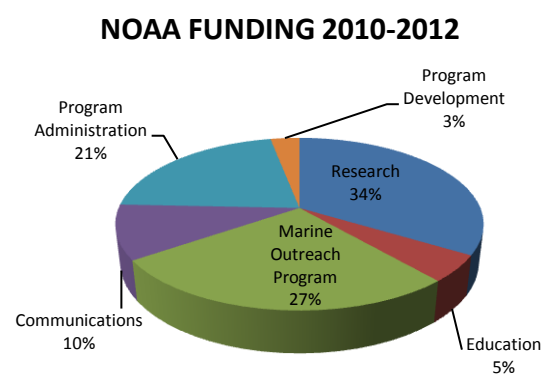


Figure 1

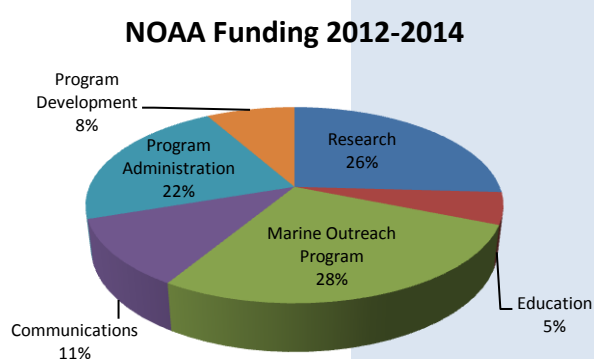


Figure 2

Figure 1. NOAA Funding 2010-2012. Represents the funding allocation of omnibus funds for the 2010-2012 biennium. A total of \$2,036,000 of federal funds was assigned to Puerto Rico Sea Grant's omnibus this biennium.

Figure 2. NOAA Funding 2012-2014. Represents the funding allocation of omnibus funds for the 2012-2014 biennium. For this biennium total federal funding was \$2,025,365.

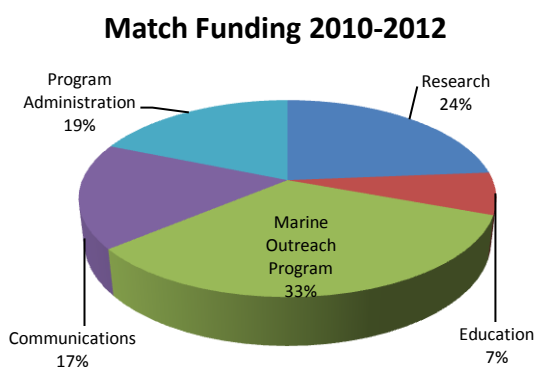


Figure 3

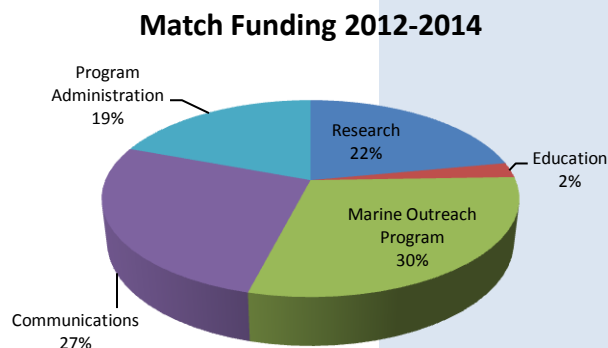


Figure 4

Figure 3. Match Funding 2010-2012. Represents match funds for the 2010-2012 biennium. A total of \$1,932,564 matched Puerto Rico Sea Grant's omnibus.

Figure 4. Match Funding 2012-2014. Represents match funds for the 2012-2014 biennium. A total of \$1,376,906 matched Puerto Rico Sea Grant's omnibus this biennium.

Leveraged Funds

Project Title	Source	Funding
2011		
Southeast Area Monitoring and Assessment Program – Caribbean (SEAMAP-C)	National Marine Fisheries Service	\$91,498
Advancing a Caribbean Marine Ecosystem Research Plan (2008-2013)	National Sea Grant Office	\$42,845
Improved Reserve Management Through Community Participation	National Fish and Wildlife Foundation (NFWF)	\$18,641.25
Species Protected by the Endangered Species Act (Factsheets)	U.S. Fish and Wildlife Service	\$12,000
2012		
Sandwatch Training Videos	UNESCO	\$50,000
Lionfish in the South Atlantic and Caribbean: Integrated Regional Research and Extension to Support Effective Management of an Invasive Marine Species	University of South Florida	\$9,450
A Social and Economic Study of Migratory Bird and Waterfowl Hunting in Puerto Rico	Subaward from Puerto Rico Department of Natural and Environmental Resources (Prime Institution: U.S. Fish and Wildlife Service)	\$326,992
Southeast Area Monitoring and Assessment Program – Caribbean (SEAMAP-C)	National Marine Fisheries Service	\$87,927
Advancing a Caribbean Marine Ecosystem Research Plan (2008-2013)	National Sea Grant Office	\$44,159
2013		
Southeast Area Monitoring and Assessment Program – Caribbean (SEAMAP-C)	National Marine Fisheries Service	\$80,838
Economic Valuation for Coral Reefs	NOAA Office of National Marine Sanctuaries	\$190,000
2014		
Southeast Area Monitoring and Assessment Program – Caribbean (SEAMAP-C)	National Marine Fisheries Service	\$88,608
Laguna Cartagena: Interpretive Panels & Education Sheet	U.S. Fish and Wildlife Service	\$4,631.75
Agroforestry Fact Sheets	USDA Forest Service	\$25,000

Funded Research

2010-2012

1. *Sea fan aspergillosis: Demography, impact and stress*. Sabat, Alberto. Department of Biology, University of Puerto Rico at Rio Piedras
2. *A sedimentary record of marine flooding events from coastal salt ponds, southwest Puerto Rico*. Sherman, Clark E. Department of Marine Sciences, University of Puerto Rico at Mayagüez
3. *The coast's bailout: Coastal resource use, quality of life and resilience in Puerto Rico*. García-Quijano, Carlos. Department of Sociology and Anthropology, University of Rhode Island, Kingston
4. *Long-term passive acoustic tracking of juvenile blacktip and lemon sharks: An investigation into the spatiotemporal dynamics and connectivity of shark nursery habitat in St. John, USVI*. Skomal, Gregory. School for Marine Science and Technology, University of Massachusetts
5. *Application of the soil and water assessment tool model (SWAT) to estimate discharge and sediment yields from the Río Grande de Añasco watershed, Puerto Rico*. Ramos-Sharrón, Carlos. Island Resources Foundation
6. *Potential future land loss of small islands of Puerto Rico and the United States Virgin Islands*. Bush, David. Department of Geosciences, University of West Georgia

2012-2014

1. *Development of the Puerto Rico beach and surfzone currents warning system*. Canals, Miguel. Department of Engineering Science and Materials, University of Puerto Rico at Mayagüez
2. *Movement patterns of bonefish (*Albula spp.*) inhabiting reef flats in Culebra, Puerto Rico: From ecological connectivity to sustainable use for a recreational fishery*. Danylchuk, Andy. Department of Environmental Conservation, University of Massachusetts at Amherst
3. *Deciphering phosphorescent bay: New approaches towards the understanding of this unique ecosystem*. Soler, Brenda. Department of Marine Sciences, University of Puerto Rico at Mayagüez
4. *An interdisciplinary evaluation of the fishery for *Cittarium pica**. Forrester, Graham. University of Rhode Island, Kingston

2014-2016

1. *The immune response of *Diadema antillarum* and recovery from Caribbean-wide mass mortality*. Beck, Gregory. University of Massachusetts
2. *Reef health, fish diseases, and habitat connectivity: Understanding the role of ectoparasites as vectors for disease, energy transfer, and barometers of reef ecosystem health*. Sikkell, Paul. Arkansas State University
3. *Evaluation of perceptions and experimental planting techniques of mangrove forest in Parque La Esperanza, Cataño, Puerto Rico*. Rodríguez-Fourquet, Concepción. University of Puerto Rico at Bayamón
4. *Connectivity between shallow and mesophotic ecosystems in Puerto Rico and the U.S. Virgin Islands: Using corals and commensal fauna*. Schizas, Nikolaos. University of Puerto Rico at Mayagüez
5. *Genetic structure and diversity of bottlenose dolphin, *Tursiops truncatus*, Off Puerto Rico*. Rodríguez, Grisel. University of Puerto Rico at Mayagüez
6. ** Hyperspectral remote sensing of water quality parameters impacting coral reef health and resilience in Puerto Rico*. Armstrong, Roy. University of Puerto Rico at Mayagüez
7. ** Building a multi-institutional effort to understand regional connectivity: Linking fish, essential habitats and ecosystems for effective marine resource management*. Jordaan, Adrian. University of Massachusetts
8. ** Ecosystem-level impacts of community-based coral reef health rehabilitation in light of rapidly evolving ecological paradigms*. Suleimán-Ramos, Samuel. Sociedad Ambiente Marino
9. ** Exposure and adaptive capacity to floods: A comprehensive vulnerability assessment of Rincón's neighborhoods*. Dávila, Saylisse. University of Puerto Rico at Mayagüez
10. ** Towards potential beach nourishment in Rincón: Seamless RTK surveying, sediment compatibility analysis and an online tool for data sharing*. Canals, Miguel. University of Puerto Rico at Mayagüez
11. ** Life cycle cost analysis of beach restoration: Rincón, PR testbed*. Aponte-Bermúdez, Luis A. University of Puerto Rico at Mayagüez

*Funded with 2014 minibus funding.

Addendum

Annotated list of PRSG's contributions

- The goal of having sustainable tropical fisheries requires the commitment of all the stakeholders. Puerto Rico Sea Grant partnerships and joint efforts with the Caribbean Fisheries Management Council, NOAA in the Caribbean, the DNER and the DNERs' Fisheries Research Laboratory, and the Artisanal Fishers' Federation (FEPDEMAR, by its Spanish acronym) have resulted in building a coherent effort to provide the best available science for the management of the resources, decision making, and information transfer among all the stakeholders.
- Worldwide research on the design and implementation of Marine Protected Areas (MPA) suggest that the successful development of reserves requires an ecological approach, social science information, policy science, and a long-term commitment to engage stakeholders in the difficult process of stewardship of MPAs. Partnerships with community-based organizations in Rincón and Culebra, municipal governments, DNER MPA managers, NOAA Coral Reef Conservation Program, national and international environmental NGOs, researchers and fishermen associations and stakeholders, with the leadership of Sea Grant and CIEL are participating in the stewardship of the MPAs, through management boards.
- A collaborative effort among the Sea Grant College Programs of the South Atlantic and Caribbean regions (Florida Sea Grant, Georgia Sea Grant, North Carolina Sea Grant, South Carolina Sea Grant and Puerto Rico Sea Grant) to jointly developed an integrated research-education-extension project to address the issue of the rapidly expanding population of lionfish in US waters of the western Atlantic. Through this project we have increased the awareness among extension professionals and their clientele regarding lionfish identification, safe handling, reporting and impacts and developed new information, protocols and/or tools to support the management of regional lionfish populations both in shallow and deep-water western Atlantic habitats. Thanks to this educational effort, people in Puerto Rico and the USVI have become aware of lionfish, how to handle it, and learned that it is edible and not poisonous when handled correctly and developed economic opportunities.
- PRSG with the collaboration of the US National Park Service and the US Environmental Protection Agency, coordinated a dialog with experts from different academic disciplines to generate recommendations for a climate change adaptation public policy for Puerto Rico. Twenty-seven (27) experts on the fields of planning, economy, environmental sociology, agriculture, biology, ecology, outdoor recreation, tourism, engineering and the insurance sector participated in this process. Climate change and coastal hazards adaptation recommendations were developed and presented to the president of the Puerto Rico Planning Board who adopted them and included for the first time in the Land Use Plan for Puerto Rico.
- Through the **Center for the Education on Environmental Climate Change** (CENECCA, by its Spanish acronym), which is our engine to disseminate the science of climate measurement and adaptation and the development of tools for climate relevant decision making, Puerto Rico Sea Grant is increasing the availability, accessibility, and utility of relevant scientific tools and information, to respond to both long-term climate change impacts and near-term effects of extreme weather.
- A cooperative agreement among the PRSG and the US Fish and Wildlife Service was established to build awareness about candidate, threatened and endangered species by producing educational materials with the most up-to-date scientific information available about species protected by the Endangered Species Act (ESA) in the Caribbean. The Service provides technical assistance, including the latest scientific information about Caribbean listed species and Sea Grant provides its expertise in the areas of flora and fauna illustration, document drafting, editing and production to create original illustrations of species and a collection of fact sheets that will be used and distributed widely by both organizations.
- Schoolteachers from Puerto Rico are in great need for resources to educate their students about topics relevant to marine and coastal ecosystems, its conservation and sustainable use. Based on these needs, PRSG has established a collaborative effort with the Puerto Rico Department of Education, to advance ocean literacy teaching capacities of teachers and consequently that of students.

- In collaboration with the Caribbean Fisheries Management Council, Puerto Rico Sea Grant published Dr. Hector Ruiz subaquatic photography book *Bajo las olas (Beneath the Waves)*, which offers the public the opportunity to increase their knowledge about marine and coastal resources through beautiful underwater artistic photography and provides information about the organisms highlighted in the photos. The Arts Coalition of Puerto Rico recognized *Bajo las Olas* as one of the best five (5) art books produced in Puerto Rico in 2013.
- For a fourth time, Puerto Rican lifeguards had the opportunity to receive instruction and training from open water rescue professionals of the Florida USLA Chapter. Under the Sea Grant leadership, Puerto Rican lifeguards organized the first USLA Puerto Rico Chapter which already has more than 50 members <http://uslapr.wix.com/uslapuertorico>. At the same time the NPC adopted USLA certification standards for all their lifeguards.
- As part of our beach safety educational efforts, two (2) videos have been developed. Videos were published in Spanish with English captions and are available through our YouTube channel: <http://www.youtube.com/user/programaseagrantpr>. For more information about the Aquatic Safety Project, please access: http://www.seagrantpr.org/outreach/aquatic_safety/index.html.
- Puerto Rico Sea Grant collaborated with NOAA, DNER, and the tourism operator East Island Adventures to educate tourism services providers on a two-day workshop regarding conservation and sustainable use of coastal and marine resources in the area of La Cordillera Reefs Natural Reserve. Thirty tourism operators from various businesses participated and were able to learn about the coral reef ecosystem, its conservation, identification and economic importance through talks, hands on experience and the application of interpretation techniques. Participants are applying what they learned in their daily tourism activities and are educating their clientele in topics related to conservation and sustainable use of marine and coastal resources using materials developed by Puerto Rico Sea Grant.
- PRSG coordinated 16 Ocean Chats to strengthen networks among resource users, community leaders, managers, students and researchers. These chats also are a vehicle to present and discuss innovative scientific and practical ideas, and share research findings and recommendations at a stage before they have matured to warrant conference or journal publications. Chats are also live-streamed online using the UPR-Mayagüez Campus' webcast service.
- The SEAMAP-C program fisheries independent baseline data, standards, and indicators to support ecosystem-based approaches to land use, water, fisheries, and other resource management, is shared with a wide variety of constituencies in PR/USVI and the Caribbean through the coordination by MOP.
- The Virgin Islands Marine Advisory Services (VIMAS) and its partners provided data to the Government of the VI that has improved their ability to make sound decisions about that status of the coral reefs and associated biota.
- The USVI fishing community in particular received opportunities to contribute scientific data pertaining to the distribution and abundance of Nassau grouper by participating in the Bring Back the Nassau Grouper campaign. "Fisher Scientist Kits" were provided to fishers at various venues and events and by request; these kits contained tools and information regarding how to safely release Nassau grouper when caught as by-catch. This is part of VIMAS efforts to increase awareness in relation to fishery issues in the Territory and to offer volunteers and the general public opportunities to collaborate with scientists.
- Close to 20 tropical storms were predicted for the Caribbean region during the 2013 season. Based on these 2013 forecasts, our program convened state agencies and municipal dependencies of the coastal municipality of Cabo Rojo to converse on how to effectively improve the coordination and communication efforts to reduce hurricane vulnerability through education, prevention and response capacity. The dialogue enhanced multiagency coordination and communications to better manage and reduce hurricane vulnerability in coastal municipalities.

- With the participation and support of the community (teachers, students and the general public), Sea Grant's Marine Education Center (MEC) developed an exemplary volunteer monitoring program for marine turtles in three municipalities. The integration of the volunteer groups in this effort prevented poaching, helped hatch and raise the hatchlings, and educated the local communities with regard to the importance of conservation of these endangered marine turtle species.
- With the collaboration of the Caribbean Fisheries Management Council and the Department of Natural and Environmental Resources, PRSG developed a campaign to promote the fishing and consumption of lionfish to control the lionfish invasion. Activities included visits to fishermen villages, distribution of information, production of videos, coordination of lectures, distribution of lionfish gear and participation in radio and TV programs. As a result of this effort, lionfish consumption increased and a market for this meat was established.
- *Marine Odysseys* are a series of videos produced by PR Sea Grant to educate the general public on matters related to the conservation and sustainable use of marine and coastal resources. We have produced more than 30 videos covering information on coral reefs, marine grass beds and other marine and coastal relevant topics. Videos are available in our YouTube channel: <http://www.youtube.com/user/programaseagrantpr>.
- Puerto Rico Sea Grant in collaboration with the National Disaster Preparedness Training Center from the University of Hawaii and Hawaii Sea Grant, sponsored the FEMA Certified Coastal Community Resilience disaster preparedness course to enhance community awareness about resiliency on the islands' coastal communities, and facilitated knowledge for a target audience with little or no exposure to the tools and methodologies for enhancing community resilience. A total of 42 decision makers, stakeholders, emergency management officers and municipal officials were certified in matters related to Coastal Community Resiliency. Participants received a background on natural hazards and an approach to assess community resilience.
- In collaboration with the USEPA Caribbean Office Storm Water Program, key selected participants with responsibilities to implement erosion and sedimentation control practices at the municipal level, learned about the impact of sediment on water resources and were trained on effective implementation of management practices and the conservation of water quality on coastal and marine resources.
- Puerto Rico Sea Grant trained managers from the Puerto Rico Department of Natural and Environmental Resources (DNER) on the application of the Global Socioeconomic Monitoring Initiative for Coastal Management (SOCMON) in order to incorporate regional and local partners and facilitate community-based socioeconomic monitoring. SOCMON is now part of the DNER strategies for the development of management plans, and the incorporation of the public dependence on coral reef resources, perceptions of resource conditions, threats to marine and coastal resources, and support for marine management strategies in resource and habitat stewardship.
- In collaboration with the Natural Resources Conservation Service (NRCS), Puerto Rico Sea Grant coordinated the workshop Conservation Buffers in the Río Loco Watershed, to teach local farmers about the design of erosion control efforts to impede sedimentation to reach the coral reefs.
- PRSG coordinated a workshop where all the government agencies with responsibilities regarding emergency management for natural hazards were present to exchange information with community leaders from 8 western municipal governments. The community leaders provided information (population, location, average age of residents, disadvantage populations), situations, problems, opportunities, needs and concerns, and the agencies offered information about their responsibilities, service offering capabilities, contact information and willingness to collaborate with the communities. One important point brought by the agencies was that it is a big advantage to be able to meet with the communities out of an emergency, make connections, establish channels of communication and discuss problems beforehand with time to solve the problems. Publications highlighting evacuation routes, community shelters, storm surge maps and other information for the resiliency of the community have been developed for each community.

- The analysis of beach drowning statistics by Puerto Rico Sea Grant has been instrumental in making the island change their perceptions regarding the seriousness of drowning incidents at our beaches and the circumstances that lead to these. Through this effort, we are educating beach users regarding the dangers represented by hazardous surf, rip currents and factors that contribute to drowning (alcohol or drug use, peer pressure and carelessness). We have further highlighted this topic, into an important issue that needs to be taken into consideration by public policy developers, resource managers and the tourism industry. The National Weather Service, the PR Police Department, The Department of Natural and Environmental Resources and The Interagency Beach Management Board are using beach drowning incidents statistics generated by Puerto Rico Sea Grant to justify the need to improve aquatic safety services in Puerto Rico.
- The Tres Palmas Marine Reserve (TPMR) is home to the endangered coral *Acropora palmata* and the biggest surf break in the Caribbean (up to 40 feet waves). This marine reserve is under constant threat by coastal development activities including erosion, sedimentation, fishing activities, contamination, insufficient funding and lack of management. Puerto Rico Sea Grant has been instrumental in the development of the NGO Amigos de Tres Palmas (ATP) a collaborator in the education of the local community and resource users with regards to the critical role of the reserve in biodiversity conservation.
- Puerto Rico Sea Grant and the Agriculture Extension Service of the University of Puerto Rico (SG-AES) designed, developed and published the First Digital Spanish Library specialized in Environmental Issues for Puerto Rico in the internet site: www.bibliotecalegalambiental.wordpress.com.
- Puerto Rico Sea Grant and the Agriculture Extension Service of the University of Puerto Rico (SG-AES), in alliance with the organization "Campus Verde" designed, developed and published the internet site "Naturaleza sin Tóxicos" (www.naturalezasintoxicos.wordpress.com), a community education site about Toxic and Hazardous Waste Pollution in Puerto Rico.
- PR-SG facilitated the stakeholders' integration in the preparation of a *Sustainable Eco Tourism Proposal* for the restoration and conservation of the Boquilla Nature Reserve. The proposal was approved by the local legislature. PR-SG and the NGO "Mayaguezanos por la Salud y el Ambiente" (MSA) designed, developed and published the first website about the Boquilla Nature Reserve (www.granreservaboquilla.wordpress.com).
- Virgin Islands Marine Advisory Service (VIMAS) has partnered with the Center for Marine and Environmental Studies (CMES) researchers to conduct large-scale assessments of Virgin Islands reefs and has initiated a territorial coral reef monitoring effort of heavily impacted sites. These data, which are being provided to the VI Department of Planning and Natural Resources, will allow the Coastal Zone Management and Fish and Wildlife to establish benchmarks on the condition of coastal resources and to assess whether or not management regulations are effective at improving near-shore water quality and marine life.
- VIMAS coordinated 17 cleanups on St. Croix for 2013 Coastweeks, engaging 531 people. Six marine debris presentations were made to St. Croix school children including 200 students. On St. Thomas, 6 beach cleanups including 344 volunteers were coordinated. VIMAS partnered with the Environmental Association of St Thomas/St John (EAST) to increase the number of volunteers.
- A Sea Grant mariculture project to grow-out yellowtail and lane snappers in locally managed recirculation systems was developed at the Corozo CAUF Fishery Villa in Combate, Cabo Rojo. This effort included a program of marine outreach extension to train commercial fishers and all general public interested in raising marine fish. This project has been the first step in Puerto Rico to successfully transfer science and technology to stakeholders, while promoting sustainable aquaculture.
- Puerto Rico Sea Grant coordinates SEAMAP-C activities and serves as liaison among other SEAMAP programs, PR and USVI Universities, the CFMC, Caribbean F&WS, PR-DNER, VI-DPNR, and the NMFS. This program established a common forum plan and a coordinated evaluation methodology for fishery data

collection, which is essential for management activities. This information is essential for establishing regulatory programs for sustainable fisheries in PR and the USVI.

- Puerto Rico Sea Grant Education Component (PRSGEC) developed nineteen (19) workshops to enhance teachers' knowledge on marine science topics, improve their instructional skills, and provide high quality classroom materials to be integrated in their curricula improving teacher's knowledge in marine science concepts.
- The Marine Science Adventure is an intense PRSG program that introduces students to the marine environment through lectures, exhibitions, laboratories and field activities. These efforts promote ocean literacy and encourage lifelong knowledge and interest in marine science for k-12 students. In August of 2013, 25% of the Coastal Marine Biology Program from UPR-Humacao freshman class had participated in the Puerto Rico Sea Grant educational activities during their K-12 school program.
- Puerto Rico Sea Grant has completed a series of 30 educational bilingual videos (English and Spanish) through a \$50,000 subvention from UNESCO, meant to train leaders and volunteers on the *Sandwatch* activities and methodology, provide them with a background on climate change and introduce them to data gathering and analysis. The videos are being used in the internationalization of the *Sandwatch* project and are already being used by UNESCO in Pacific and Caribbean countries.
- Through the blog, Facebook and Twitter pages, Puerto Rico Sea Grant has been able to promote successfully, conservation and sustainable use of marine and coastal resources among a clientele that previously we could not reach.
- PRSG is the primary source of information related to coastal and marine resources in Puerto Rico. An average of 150 persons are using the resources and services of our Sea Grant collection and information center monthly. Printed and electronic resources are available through the UPR-Mayagüez Library Catalogue, which facilitates the process of searching for information and increases access to our collection. Resources are cataloged under the Library of Congress Classification System. Our information center opened an email account with chat capabilities (criem.seagrants@gmail.com) to increase and make resources more accessible to remote users. To enhance access to information sources, thematic guides are available through the Web (<https://sites.google.com/site/criemguiastematicas/>).
- The *Encounter with the Sea* workshop was coordinated for twenty-two (22) local teachers and community leaders, NGO volunteers, municipal employees and tourist service operators of the island municipality of Culebra. Resource users were able to discuss delicate and conflicting issues, learn about the needs and preferences of distinct groups and were able to establish collaborations to improve environmental education and affinity among residents of Culebra. Partners in this effort included: NOAA, Puerto Rico's Department of Natural and Environmental Resources, and the Collaborative Project of the Northeast Coast.
- Education through publications has been one of our programs' preferred methods of disseminating information related to our coastal and marine resources. During this report period, PRSG distributed copies of *Marejada* (our official emblematic magazine), *Fuete y Verguilla* (our magazine for artisanal fishermen), *A Glimpse into the World of Fishermen* (public policy paper on fisheries), and books such as *Encuentro con el mar (Encounter with the Sea)*, *Cartilla de la Zona Marítimo Terrestre (Maritime Zone Guidebook)* and *Arrecifes de coral (Coral reefs)* among others.
- The PRSG communications component participates in environmental fairs, exhibitions, field trips, visits to schools workshops and educational talks and activities coordinated by our program to increase ocean literacy among K-12 students, coastal residents and marine resource users.
- Puerto Rico Sea Grant offers advisory services to the FEPDEMAR (Federación de Pescadores de P.R. y Defensores Del Mar, Inc.) fishing organization assisting them in their efforts to become the main recognized organization representing fishery workers of Puerto Rico, by relying on their traditional

knowledge, by asserting their social standing, their political status, and educating them regarding sustainable practices and the conservation of the natural environment.

- Through our education component, PRSG is capacitating teachers in marine science concepts and ocean literacy, in order to develop their skills and address the established Science Education Standards (SES) to “guide our island toward a scientifically literate society.” Our teacher workshops capacitate educators to make use of the marine environment to stimulate students to meet national standards.
- Close to 1,400 students and 85 teachers were introduced to non-formal educational opportunities through the fun and dynamic Marine Science Adventure, an intense program that introduces students to the marine environment through lectures, laboratories and field activities. Marine education activities coordinated for K-12 students include: Marine Laboratory Experience (Plankton, Biology, Fish Classification, Invertebrates, Global Warming and Sands), Field trips (This is an Estuary, Marine Encounters, The Punta Tuna Wetland and Beaches) and Traveling Marine Exhibit (Sea Turtles and Beaches).
- A total of fifteen western coastal communities are currently participating in an effort aimed to enhance their resiliency capacities in the areas of community development, coastal management and disaster management. Our team held three (3) focus groups to gather information about the communities and conducted over 100 individual interviews with residents. Participants identified the following issues as points of concern: climate change, natural hazards and their resilience capacity.
- Sea Grant Puerto Rico with the collaboration of the Caribbean office of Natural Resources Conservation Service and Hacienda Altamira in Cabo Rojo, sponsored a workshop for decision makers, biologists, planners, and conservationists to facilitate the identification of plants, soil characterization, and hydrology indicators on the coastal wetlands and salt flats in Puerto Rico. The purpose of the workshop was to promote and provide information concerning characterization, mitigation, and the restoration of coastal wetlands and salt flats, and its importance with regards to the impacts associated with climate change.
- The SG project Beach Seine Users Education on Management Restrictions and Gear Handling Practices for Reduced Impacts, was developed as a result of the longtime mistaken practices and attitudes related to the use of beach seine gear in Puerto Rico and the implementation of new fishing regulations. The changes have resulted from recommendations of Sea Grant's Marine Outreach Program (MOP) beach seine study and outreach educational workshops for fishers. The DNER-Aguadilla enforcement section reported no violations or misuse of gear after the implementation of the law and Sea Grants’ informative fisher’s workshops. As a positive result of these educational efforts, we have established internal co-management efforts among beach seine owners to assure that beach-seine gear meets the mesh-size net limitation, combined with appropriate harvesting protocols to minimize by-catch.
- Through our efforts in commercial and recreational fish users education PRSG has earned a seat as a member of the DNER Secretary’s Fisheries Law Advisory Board, and serves as a liaison among resource users and managers, collaborating in conflict mitigation among resource users and regulators and providing important recommendations and solutions that have been adopted by the new fisheries regulations.
- VIMAS spearheaded “The Reef is Closer Than You Think” community campaign. Beginning in 2009 and continuing throughout 2012, the campaign spotlighted the importance of coral reefs of the Virgin Islands, promoted individual actions that will work to protect corals, and communicated the importance of these ecosystems to the economy. As part of this effort, VIMAS collaborated in the coordination of the VI Non-Point Source Pollution Conference with over 200 participants from across the Caribbean and the US, including a special youth session attended by 33 local youth. In response to efforts by VIMAS the community better understands how to protect the environment from land-based sources of pollution.



Impresos Sea Grant